1. (Once amended) A method for shaping surfaces, comprising:

creating an annular plasma having an energy input zone;

injecting a reactive species into the annular plasma such that the reactive species dissociates primarily past the energy input zone; and

using reactive atom plasma processing for the damage-free shaping of a surface.

2. The method of claim 1 wherein the process is carried out at about atmosphere temperature.

3. The method of claim 1 for shaping optical elements.

4. The method of claim 1 for shaping elements out of silicon.

5. The method of claim 1 for shaping silica glass optics.

6 The method of claim 1 for shaping aspheric optics.

7. The method of claim 1 operating in a subtractive manner.

8. The method of claim 1 that does not leave behind a contaminated redeposition layer.

9. The method of claim 1 using a plume of plasma.

10. The method of claim 1 using a plume of plasma operating as a sub-aperture tool.

11. The method of claim 1 wherein a plume of plasma is translated across a workpiece.

12. The method of claim 1 wherein the emission spectrum is monitored to determine process rates.

13. The method of claim 1 using carbon tetrafluoride (CF_4) in argon to create the plasma.

14. The method of claim 1 using C_2F_6 in argon to create the plasma.

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15. (Once amended) The method of claim 1 using silicon hexafluoride (SF_6) in argon to create the plasma.

18. The method of claim 1 operating an additive manner.

A3

19. (Once amended) The method of claim 1 for removing damage introduced by previous process steps.

20. The method of claim 1 for removing surface roughness.

21. (New) A method for shaping surfaces, comprising:

using reactive atom plasma processing to shape and polish a surface.

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22. (New) A method for shaping surfaces, comprising:

using reactive atom plasma processing for the damage-free shaping of a surface at about atmospheric pressure.

23. (New) A method for shaping surfaces, comprising:

using reactive atom plasma processing for the damage-free shaping of a surface;

wherein said using step includes using a flow of auxiliary gas to effect a flow of reactive gas before the reactive gas contacts the plasma.

24. (New) A method for shaping surfaces, comprising:

generating an annular plasma;

injecting a flow of reactive gas into the center of the annular plasma; and

using reactive atom plasma processing to shape a surface at about atmospheric pressure.

25. (New) A method for shaping surfaces, comprising:

creating an plasma having a central zone;

injecting a reactive species into the central zone of the plasma such that the reactive species dissociates after entering the plasma; and

using reactive atom plasma processing for the damage-free shaping of a surface.

26. (New) A method for shaping surfaces, comprising:

creating a plasma a distance from the tip of a plasma torch, the plasma having a skin;

injecting a flow of reactive gas through the skin of the plasma such that the reactive species begins to dissociate; and

using reactive atom plasma processing for the damage-free shaping of a surface.

27. (New) A method for shaping surfaces, comprising:

creating a plasma having an energy input zone;

injecting a reactive species into the plasma such that the reactive species dissociates primarily past the energy input zone; and

using reactive atom plasma processing for the damage-free shaping of a surface.